Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

A NOTE ON THE FLIGHT OF MOSQUITOES THROUGH HORIZONTAL WATER PIPES.

By W. W. KING, Surgeon, United States Public Health Service.

An attempt to get rid of or to materially reduce the excessive number of mosquitoes at my own residence in St. Thomas, Virgin Islands, resulted in some very interesting experiences and brought to my attention certain points in the habits of mosquitoes which apparently have a practical application in antimosquito work, but to which I can not find reference in the literature at my command.

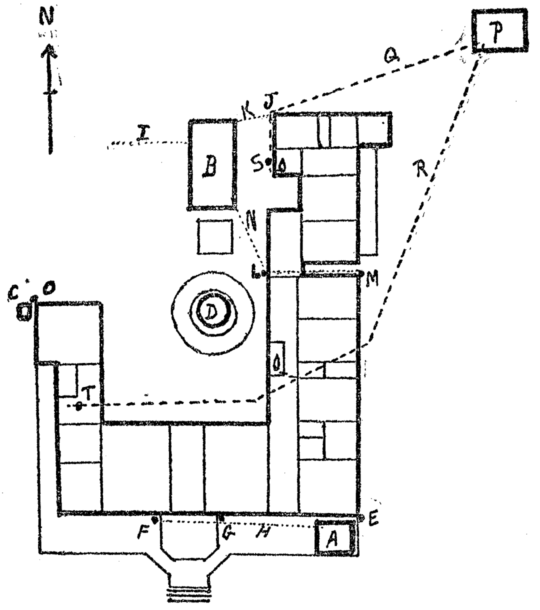
In various works treating of mosquitoes and measures for their extermination, I found reference to the necessity of screening the downspouts leading into cisterns, but no distinction was made between the spouts which descend perpendicularly and those running more or less horizontally for some distance. The following observations, so far as they go, indicate that mosquitoes do make a distinction, because they readily utilized perpendicular spouts to pass in and out, but did not enter through spouts that had a considerable horizontal section. On the other hand, horizontal pipes nearly 200 feet in length were no hindrance to their escape when they were breeding in cisterns. The conditions under which these observations were made are given in considerable detail for the better comprehension of circumstances which might have affected the behavior of the mosquitoes.

The house crowns the summit of a rather steep hill, 240 feet high, at the edge of town where the houses are sparsely scattered. Hence it seemed reasonable to suppose that the elimination of breeding places on the premises would reduce the number of mosquitoes to a minimum. As is usual in St. Thomas, the water supply is rain water collected from the roof into cisterns and tanks, in this case two underground concrete cisterns, "A" and "B," and a small iron tank "C." From the cisterns a windmill pumps the water to a cedar tank, "D," in an ancient stone tower, whence it is piped throughout the house. (See plan.)

Search for mosquito breeding places showed larvæ in good numbers in both cisterns and in the iron tank, but not in the tank "D" in the tower, and it is worthy of note here that even when mosquitoes were most abundant in the house, larvæ were never found in this tank, although there were unscreened openings in its board covering, and the dimly lighted and wind-protected interior of the tower and the always-open door below would seem to afford a favorable avenue to the water above. The rim of the tank is 29 feet above ground, a height apparently not prohibitive for mosquito breeding, because I have found larvæ in tanks on the roofs of houses in St. Thomas at much greater heights.

The cistern "A" under the front veranda had a close-fitting trapdoor always closed, and the overflow outlet was well screened, so that the only means by which mosquitoes could enter or leave this cistern was by the unscreened in-flow pipes from the roof. A 2½-inch downspout "E" descends perpendicularly except for the lower 2 feet, where it bends at an angle of 22.5 degrees, then makes a right-angle turn into the cistern. The entire length of this spout is 14 feet. The downspouts "F" and "G," 4 inches in diameter, discharge into the cistern through a horizontal pipe "H," 4 inches in diameter from "F" to "G," and 5 inches from "G" to the cistern, a distance of 32 feet.

Mosquito larvæ disappeared shortly after the downspout "E" was screened. "F" and "G" were left unscreened, but larvæ never reappeared in this cistern, although mosquitoes were abundant in the house and on the veranda for several months later.



Approximate scale: 1 inch=60 feet.

The slight deviation in the course of the upright spout "E" was no obstacle to the passage of mosquitoes, yet they did not enter by the way open through "G" and "H" (12 feet down and 32 feet horizontally), either on account of the distance or the horizontal direction, or both factors combined, although the size of the pipe was larger than "E." As shown by the flicker of a candle flame, there was a slight upward current of air through the horizontal pipe, but it was less than that through the perpendicular spout, against which mosquitoes did enter the cistern; hence the air current could hardly have been a factor. If anything, these air currents, by carrying the scent of the water upward, would have favored the use of the pipe "H" by mosquitoes.

The cistern "B" has two mosquito-proof trapdoors but one of them had remained open more or less constantly. A 6-inch overflow pipe "I," 25 feet long, runs horizontally just beneath the surface of the ground to discharge over a terrace wall. Water enters the cistern by a 4-inch downspout "J," 10 feet high, through a 4-inch horizontal pipe "K," 12 feet long; and by the downspouts "L" and "M," through the horizontal pipe "N." The spout "L" runs downward about 12 feet, and the horizontal section "N," from "L" to the cistern, is 20 feet in length; both are 5 inches in diameter.

None of these pipes were screened yet the mosquito larvæ disappeared from the cistern after the trapdoor was kept constantly closed, and reappeared only once later, in small numbers, probably from mosquito eggs deposited on the water in a sagging gutter, and washed into the cistern. No more larvæ were noticed after repairs were made to the gutter.

It is believed that the mosquitoes which hatched in this cistern after the trapdoor was permanently closed, and those hatched from larvæ remaining in cistern "A" when the spout "E" was screened, found their way out through the unscreened spouts in spite of their horizontal sections, aided possibly by the upward air current. A comparatively strong current of air entered cistern "B" through the overflow pipe and passed out with less force, through the rain spouts, but none of the air currents were sufficiently strong to hinder the flight of mosquitoes. A considerable portion of the surface of the water in these cisterns could be observed for dead mosquitoes but only an occasional one was seen, too few to account for the number of larvæ which had been present.

To test this point, a jar containing some hundreds of pupæ and well developed larvæ was suspended in cistern "B," and the spouts were screened to catch the mosquitoes at the point of escape. When observed some days later it was found that the screens had been imperfectly fastened and had become disarranged by heavy rains, so that mosquitoes could easily pass. The mosquitoes had hatched and disappeared, but as none were caught the experiment was inconclusive, and it can only be supposed that the mosquitoes escaped by the rain pipes as the only way out.

The iron tank "C" has a small overflow opening on one side and a number of small holes in the top. One 3-inch downspout "O" descends perpendicularly from the roof, a distance of 10½ feet. All openings were screened or plugged except this spout, yet mosquito larvæ persisted until the spout also was screened.

The plague of mosquitoes was only slightly if at all diminished by the elimination of the cisterns and tank as sources of supply. Search for other breeding places was unsuccessful for a long time until the septic tank "P" was opened. Mosquitoes by the hundreds flew out of the opened trap, and the foul water at the bottom was teeming with larvæ. This tank had not been considered a possible breeding place as it was thought to be inaccessible to mosquitoes because the trapdoor was always tightly closed and the ventilator was effectively screened. The only other openings are the 4-inch drain "Q" and the 5-inch drain "R" carrying water-closet, bath and kitchen waste from the house. At the highest points in each drain are ventilating pipes, "S" and "T," 2½ and 4 inches in diameter.

Inasmuch as mosquitoes did not seek the water in the cisterns through horizontal rain pipes comparatively short in relation to the drains, it is not presumable that the female mosquitoes would enter these ventilators and traverse the long horizontal pipes to reach the water in the septic tank. Yet this water was alive with larvæ, a fact apparently explainable in only one way; that the mosquito deposited her eggs on the water in the bowls of the toilets, and they were flushed through the drains into the septic tank where the larvæ developed.

The mosquitoes bred in this place had but one way to escape, which was to fly back up the drains and out the ventilating pipes. The horizontal distance to the bottom of the nearer outlet, "S," is 82 feet, and to the farther one, "T," 191 feet. The upright ventilators are 13 and 14 feet high, respectively. Positive evidence that the mosquitoes did escape by this route was secured by covering the ventilator hoods with cloth netting and catching a large number of mosquitoes inside the netting. In their passage upward through the drains, the mosquitoes were probably aided somewhat by an upward current of air. The odor of kerosene thrown on the water in the tank was perceptible at the nearer ventilator in about five minutes.

In a few days after screening the ventilators and oiling the septic tank, the plague of mosquitoes sensibly diminished, and in a short time the house was practically free from them. These mosquitoes were roughly identified as *Culex quinquefasciatus*. At first there had been some white-striped mosquitoes apparently Aëdes, but they were not seen after the cisterns and iron tank were free from larvæ.

The chief points of these observations are as follows: (*a*) Mosquitoes entered and left cisterns through unscreened perpendicular waterspouts 2½ and 3 inches in diameter and 14 and 10 feet high.

(*b*) Mosquitoes did not enter cisterns through larger unscreened water spouts when these pipes had a horizontal section from 12 to 32 feet long. No observations were obtained of a horizontal distance of less than 12 feet.

(*c*) Mosquitoes bred in the cisterns and septic tank and having no other means of exit passed through horizontal pipes 4 and 5 inches in diameter for a distance of 191 feet in the longest instance, aided probably to a certain degree by air currents. No doubt they would pass through greater distances, but there was no opportunity to observe any instance of it.

These observations deal with only one or two species of mosquitoes and are limited in number and circumstances, but if they should be generally true under conditions ordinarily met with in antimosquito work, then they have an actual practical value.

In accordance with these facts it seems unnecessary to screen waterspouts and other pipes into cisterns and similar deposits of water when such pipes have a considerable horizontal section. The saving in this way of time, labor, and materials may be quite appreciable. However, the screening of such openings will be required in those instances where mosquitoes are breeding from eggs carried into the water from an outside place of deposit.

Sewers, cesspools, etc., may be breeding places of certain kinds of mosquitoes, and their possible passage for considerable distance up the soil and drain pipes must be considered. Such pipes are usually trapped near the sewer or cesspool, but not always, especially in old constructions and in localities where plumbing laws are lax or nonexistent. It is probable that the most important antimosquito work is done in the smaller towns, villages, and isolated houses, where local deposits of water are apt to be found in place of a piped water system.

EPIDEMIC INFLUENZA.

PREVALENCE IN THE UNITED STATES.

Telegraphic reports received by the United States Public Health Service for the week ended February 22, 1919, indicate that there has been little change in the number of cases of influenza reported throughout the United States. These reports are received from State health officers and from zones surrounding Army camps.

As compared with the week ended February 15, decreases in the number of cases notified are reported from Arkansas, California, Florida, Louisiana, Maine, New Jersey, and Vermont. Increases are reported from Alabama, Connecticut, Illinois, Iowa, Kansas, North Carolina, and Virginia. The number of cases is not large, however, and the increases in most instances are very slight.

The following table shows the number of cases of influenza reported in the zones surrounding military camps in the United States from December 29, 1918, to February 22, 1919, inclusive, by weeks. The cases reported from September 15 to December 28, 1918, are shown in the Public Health Reports, vol. 33, No. 49, December 6, 1918, pages 2153–2154, and vol. 34, No. 1, January 3, 1919, pages 1–2.